

[Document Type] CLAIMS

[Claim 1]

A time-domain pulsed spectroscopy apparatus comprising:

    a pulsed laser light source;

    a splitting unit configured to split pulsed laser light from the pulsed laser light source into excitation pulsed laser light and detection pulsed laser light;

    a pulsed-light emitting unit configured to emit pulsed light including wavelengths in the far-infrared wavelength region due to irradiation of the excitation pulsed laser;

    a detector configured to detect a wave form signal of the electric field intensity of reflected or transmitted pulsed light from the sample onto which the pulsed light from the pulsed-light emitting unit is radiated;

    a sample holder configured to hold the sample; and

    sample-unit entrance and exit optical systems configured to guide the pulsed light from the pulsed-light emitting unit to the sample and to guide to the detector pulsed light reflected from or transmitted through the sample due to the irradiation,

    wherein the time-domain pulsed spectroscopy apparatus further comprises:

        at least one optical-path-length varying unit for setting a photometric range, disposed in an incident-side optical path from the splitting unit to the pulsed-light emitting unit

and/or in a detection-side optical path from the splitting unit to the detector; and

at least one optical delay unit for the wave form signal measurement, disposed in the incident-side optical path from the splitting unit to the pulsed-light emitting unit and/or in the detection-side optical path from the splitting unit to the detector.

[Claim 2]

A time-domain pulsed spectroscopy apparatus according to Claim 1, wherein the optical-path-length varying unit for setting a measurement range is a movable reflector.

[Claim 3]

A time-domain pulsed spectroscopy apparatus according to Claim 1, wherein:

the optical-path-length varying unit for setting a measurement range is a movable or fixed reflector; and

either reflector includes, at the incident side of the pulsed light to the reflector, a gate member configured to pass or block the pulsed light to the reflector, and by switching between passing or blocking, it is possible to add an optical path via one, two, or more of the reflectors to extend the optical path length and/or to skip one, two, or more of the reflectors to shorten the optical path length.

[Claim 4]

A time-domain pulsed spectroscopy apparatus according to

Claim 3, wherein passing or blocking of at least one of the gate members is performed by inserting and removing the gate member, by translational motion, into and from the optical path.

[Claim 5]

A time-domain pulsed spectroscopy apparatus according to Claim 3, wherein passing or blocking of at least one of the gate members is performed by inserting and removing the gate member, by rotation, into and from the optical path.

[Claim 6]

A time-domain pulsed spectroscopy apparatus according to one of Claims 1 to 5, further comprising: a driving device configured to automatically scan the optical-path-length varying unit and/or the optical delay unit; and a computer control apparatus configured to automatically control the driving device.

[Claim 7]

A time-domain pulsed spectroscopy apparatus according to one of Claims 1 to 6, wherein the sample holder and the sample-unit entrance and exit optical systems are provided inside an auxiliary optical unit that can be attached to and removed from the time-domain pulsed spectroscopy apparatus to enable replacement thereof.

[Claim 8]

A time-domain pulsed spectroscopy apparatus according to

Claim 7 having an optical design that provides optical alignment with respect to the auxiliary optical unit.

[Claim 9]

A time-domain pulsed spectroscopy apparatus comprising:  
a pulsed laser light source;  
a splitting unit configured to split pulsed laser light from the pulsed laser light source into excitation pulsed laser light and detection pulsed laser light;  
a pulsed-light emitting unit configured to emit pulsed light including wavelengths in the far-infrared wavelength region due to irradiation of the excitation pulsed laser;  
a detector configured to detect a time-serial signal of the electric field intensity of reflected or transmitted pulsed light from the sample onto which the pulsed light from the pulsed-light emitting unit is radiated;  
a sample holder configured to hold the sample; and sample-unit entrance and exit optical systems configured to guide the pulsed light from the pulsed-light emitting unit to the sample and to guide to the detector pulsed light reflected from or transmitted through the sample due to the irradiation,  
wherein, from the pulsed-light emitting unit to the sample-unit entrance and exit optical systems and/or from the detector to the sample-unit entrance and exit optical systems, one or a plurality of planar mirrors and one or a plurality of

aspherical mirrors are disposed in this order.

[Claim 10]

A time-domain pulsed spectroscopy apparatus according to one of Claims 1 to 8 wherein, in the time-domain pulsed spectroscopy apparatus comprising:

a pulsed laser light source;

a splitting unit configured to split pulsed laser light from the pulsed laser light source into excitation pulsed laser light and detection pulsed laser light;

a pulsed-light emitting unit configured to emit pulsed light including wavelengths in the far-infrared wavelength region due to irradiation of the excitation pulsed laser;

a detector configured to detect a wave form signal of the electric field intensity of reflected or transmitted pulsed light from the sample onto which the pulsed light from the pulsed-light emitting unit is radiated;

a sample holder configured to hold the sample; and

sample-unit entrance and exit optical systems configured to guide the pulsed light from the pulsed-light emitting unit to the sample and to guide to the detector pulsed light reflected from or transmitted through the sample due to the irradiation,

from the pulsed-light emitting unit to the sample-unit entrance and exit optical systems and/or from the detector to the sample-unit entrance and exit optical systems, one or a

plurality of planar mirrors and one or a plurality of aspherical mirrors are disposed in this order.